PATENT SPECIFICATION (11) 1 550 732

1 550 732

(21) Application No. 35586/77 (22) Filed 24 Aug. 1977
(23) Complete Specification filed 13 March 1978
(44) Complete Specification published 22 Aug. 1979
(51) INT. CL.² G07F 17/34
(52) Index at acceptance
G4V 118 BK

(72) Inventors PETER DAVID CROWE
BRIAN ROBINSON KIRK
RICHARD IAN SHARPE

(54) A MECHANISM FOR USE IN APPARATUS FOR PLAYING A GAME OF CHANCE

(71) We, PBR ELECTRONIC DESIGNS LIMITED, a British Company, of 17, Wood Street, Swindon, Wiltshire, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a mechanism for use in apparatus for playing a game of chance.

According to this invention there is provided a mechanism for use in apparatus for playing a game of chance, the mechanism comprising a rotary member, drive means for rotating the rotary member, and a programmed control system, the control system being arranged for providing a demand for a random rotation of the rotary member and supplying this demand to the drive means so this rotation is effected, the control system including means for using such a demand to compute, from the known starting position of the member, an indication of the stopping position of the member as a result of such a random rotation, without reference to the member itself, either while rotating or when stopped, and means for using such an indication in determining whether or not a win is achieved.

This invention also comprises apparatus for playing a game of chance, incorporating such a mechanism.

Such apparatus could be of the kind known as a "fruit machine". In such a machine, reels, drums, or discs bear symbols around their peripheries which become visible through windows in the machine. During a game, the reels are rotated by random amounts thus producing a random selection of symbols at the windows. Certain combinations of these symbols appearing at the windows mean prizes to be awarded to the form of tokens, cash, or game credits.

In use of some examples to be described of mechanisms according to the invention, the positions of rotary members in the form of such reels are controlled by means of a control system such as a computer, micro-processor, or other computing device such that the angular positions and movements of the reels are known and can be predicted accurately without recourse to angular positional feed-back information from the reel for each individual symbol. In effect, the computer; micro-processor, or other computing device derives the new combination of symbols and causes the reels to be driven by the appropriate angular amounts or for the equivalent and required amounts of time such that when the reels come to rest, the appropriate and desired symbols are displayed at the windows.

In each example, each reel is provided with a datum point and there is means for sensing the datum point during rotation, the control system being such that in response to the use of the mechanism for a first time, it causes the drive means to rotate the reel by at least one full revolution, and uses an indication from the sensing means due to sensing the datum point to ascertain the position in which the reel stops as a result of the or each full revolution. The datum point could be provided by a metallic, ceramic, or magnetic member mounted on the reel, the sensing means comprising a magnetic flux sensor such as a hall-effect sensing device or a conventional magnetic pick-up head (similar to that used on a tape recorder). Alternatively, the datum point could be provided by a metallic or ceramic member or other suitable member, the sensing means comprising capacitance or inductance change sensing means or optical sensing means. Thus, each reel is rotated by a random angular displacement without feed-back to the control system of its current angular posi-

tion with respect to the given datum point. The control system could be arranged for providing an indication of an estimated current position of the reel during such a random rotation. In this case, the control system could be capable of using indications from such sensing means during such a random rotation to update its indication of the reel's estimated current position, if necessary.

The symbol displayed on the perimeter of an individual reel when the reel is at rest could be determined by the control system correlating the angular position of the reel, without external reference, with respect to the reel's datum point with a list of symbols whose order is specified with respect to the reel's datum point, a win situation being dependent on the relative positions of the individual reels relative to their individual datum points and hence the displayed symbols.

The drive means for each reel could be uni-directional or bi-directional drive means, such as a uni- or bi-directional electrical stepping motor, a pneumatic or hydraulic stepping motor, a pneumatic or hydraulic motor, or an AC or DC electric motor.

The invention will now be described by way of example, with reference to the accompanying drawings, in which:

Figures 1, 2 and 3 show alternative forms of reel driving arrangements for fruit machines, as end views,

Figure 4 shows in block diagrammatic form how a control system is provided, and

Figure 5 shows in block diagrammatic form an alternative control technique.

In each of Figures 1 and 2 there are: a motor 1, which may be a stepping motor or a non-stepping motor, driven electrically, mechanically, hydraulically or pneumatically; a reel 2, which is one of several such reels; a base plate 3 upon which all other parts are mounted (one or more reels may be mounted on the same plate); a reel datum point sensor 4, which may use magnetic, inductive, capacitive, or other proximity sensing means to detect the presence or absence of a datum point on the reel; an axle 5, which is a shared axle for the reels; a free-running wheel bush 6 supporting the centre of the reel; and gear teeth 7 which are integral with the reel and which engage with teeth on a gear 8 of the motor.

Figure 3 shows an alternative in which the motor provides a drive shaft 5' for its respective wheel, driving the wheel directly, thus eliminating the gear teeth 7. Otherwise, the refcrence numerals indicate corresponding items to those in Figures 1 and 2.

The mechanism works as follows in each case.

A control system always keeps an internal record of the current position of each of the reels. This record may be in terms of current angular position or in terms of the symbol showing in the window of the machine in use of the mechanism. When a new position is required, the control system calculates a random reel spin time or random angular displacement and then calculates from the present position the final rest position for the reel. If the motor is a stepping motor, it then sends the appropriate number of pulses to the motor to effect the required movement. If required, the relative timing of stepping pulses may be adjusted by the control system such that the inertia of the motor and reel is compensated for when starting or stopping the motor. Each time the reel datum point passes the sensor, the control system checks the correspondence between its internal record of the reel position and the actual position as given by sensing the datum point. If these values do not correspond within some predefined allowable limit of error, then the internal records of the control system are corrected such that it is internally re-synchronised to the reel. When the reel mechanism is used for a first time, for instance when the machine it is in is switched on, the control system assesses the reel position by rotating the reel at least one full revolution and using an indication from the sensor due to sensing the datum point as the reel revolves to ascertain the position in which the reel stops, the reel stopping in the position showing the symbol that was showing before the machine was switched on and thus the random sequence of the machine reel positioning is preserved whilst the actual initial reel position is measured. An alternative method would be to store, at the end of each game or session, the current reel position in a non-volatile memory such as an N-MOS, COSMOS, or other semi-conductor random access memory, or in a mechanical, magnetic, magnetic-bubble, or other data latching mechanism. The stored reel position could be read back into the control system at the beginning of each new session or game.

The control system may be a computer, micro-processor, calculator, relay controller, or other device capable of retaining data values and making computations. Referring to Figure 4, the control system, 9, has three registers, accumulators, or other memory elements A, B and C which hold values as follows:—

A—a value representing the current angular position.

B—a value representing the required angular position, after the reel has completed a movement.

C—a value representing the relative posi-

tions defined in A and B, which may mean more than one whole revolution of the reel.

The control system derives these values before the reel moves. The new final reel position for the game about to be played is calculated for all the reels controlled by the control system. It then drives the motor and updates the value in C by either incrementing it, decrementing it, adding or subtracting a value, or otherwise modifying it such that it represents the angular movement of the reel. Simultaneously, the value in A is updated such that it represents the current reel position. Each time the datum point is sensed, the value in A is checked to ensure that the control system's assessment of the reel position is accurate. When the value in C reaches zero, then the value in A should be equivalent to the value in B, in other words the reel will be in the correct and desired position. At this time, because the motor has moved the required angular amount originally defined by the value in C, under the control of the control system, the motor is decelerated and stopped by either electrical, hydraulic, or pneumatic means, or by use of a solenoid operated lever locating with a toothed wheel aligned with the symbol positions on the reels.

When all reels have been stopped at the desired positions, the value in A for each reel can be correlated with a corresponding symbol on the periphery of the reel by means of a table of symbol codes ordered in the same way as or in a predetermined coded relationship with the symbols on the actual reel. By using the value in A, or some values derived from it, to index this table (which is in accordance with the table illustrated in Figure 5) the current angular positions can be converted into corresponding symbols. Prizes can be calculated either on combinations of symbols or on combinations of reel angular positions.

An alternative control technique could use the system illustrated in Figure 5. Here two registers or memory elements hold values which act as pointers to a table of symbols. The order of the symbols corresponds in some well defined way to the order of the symbols on the physical reel. The advantage of holding these symbol codes in the memory of the control system is that when the symbols are changed on the reel, then the table of symbols can be changed in the control system in a similar manner such that the control system will automatically know which symbol is opposite the window in the machine.

Pointer D always points to the current position in the table that represents the current position of the reel. As the reel rotates, so pointer D indexes down the table and when it gets to the end it starts again at the start to keep in step with the reel. Pointer E points at the desired stopping position of the reel. The motor is controlled in a similar way to the previous method and drives the reel until pointer D and pointer E are pointing at the same symbol. An additional "rotation counter" F may be used if multiple rotations of the wheel are required before coincidence of the relative positions of D and E is detected.

WHAT WE CLAIM IS:—

1. A mechanism for use in apparatus for playing a game of chance, the mechanism comprising a rotary member, drive means for rotating the rotary member, and a programmed control system, the control system being arranged for providing a demand for a random rotation of the rotary member and supplying this demand to the drive means so that this rotation is effected, the control system including means for using such a demand to compute, from the known starting position of the member, an indication of the stopping position of the member as a result of such a random rotation, without reference to the member itself, either while rotating or when stopped, and means for using such an indication in determining whether or not a win is achieved.

2. A mechanism according to claim 1, wherein the rotary member is provided with a datum point and there is means for sensing the datum point during rotation, the control system being such that, in response to the use of the mechanism for a first time, it causes the drive means to rotate the member by at least one full revolution, and uses as indication from the sensing means due to sensing the datum point to ascertain the position in which the member stops as a result of the or each such full revolution.

3. A mechanism according to claim 1 or 2, wherein the control system is arranged for providing an indication of an estimated current position of the member during such a random rotation.

4. A mechanism according to claims 2 and 3, wherein the control system is capable of using such indications from the sensing means during such a random rotation to update its indication of the estimated current position of the rotary member, if necessary.

5. A mechanism according to claim 2 or 4, wherein the datum point is provided by a metallic, ceramic, or magnetic member mounted on the rotary member and the sensing means comprises a magnetic flux sensor.

6. A mechanism according to claim 5, wherein the sensor comprises a Hall-effect sensing device or a magnetic pick-up head.

7. A mechanism according to claim 2 or 4, wherein the datum point is provided

by a metallic or ceramic member or other member and the sensing means comprises capacitance or inductance change sensing means or optical sensing means.

8. A mechanism according to any preceding claim, wherein the drive means comprises bi-directional drive means.

9. A mechanism according to any preceding claim, wherein the drive means is a stepping motor.

10. Apparatus for playing a game of chance, incorporating a mechanism according to any preceding claims.

11. Apparatus according to claim 10, wherein a plurality of such rotary members bear symbols around their peripheries which become visible through windows in the apparatus, during a game, the members being rotated by random amounts in use, thus producing a random selection of symbols at the windows and certain combinations of these symbols appearing at the windows meaning prizes to be awarded in the form of tokens, cash, or game credits.

12. A mechanism for use in apparatus for playing a game of chance, or apparatus for playing a game of chance, substantially as herein described with reference to Figures 1, 2, 4 and 5 of the accompanying drawings.

13. A mechanism for use in apparatus for playing a game of chance, or apparatus for playing a game of chance, substantially as herein described with reference to Figures 3, 4 and 5 of the accompanying drawings.

HASELTINE LAKE & CO.,
Chartered Patent Agents,
28 Southampton Buildings,
Chancery Lane,
London WC2A 1AT.
— and —
Temple Gate House,
Temple Gate,
Bristol BS1 6PT.
9 Park Square,
Leeds LS1 2LH.

Printed for Her Majesty's Stationery Office by The Tweeddale Press Ltd., Berwick-upon-Tweed, 1979
Published at the Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.

1550732 COMPLETE SPECIFICATION
3 SHEETS This drawing is a reproduction of the Original on a reduced scale
Sheet 1

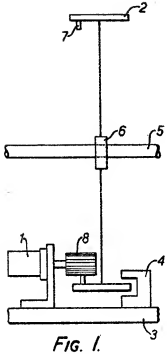

FIG. 1.

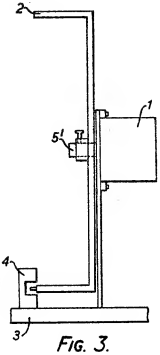

FIG. 3.

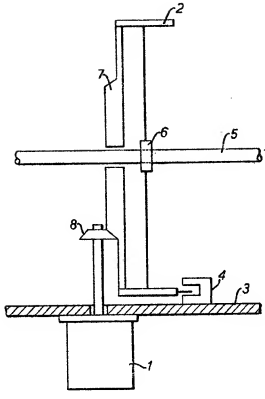

FIG. 2.

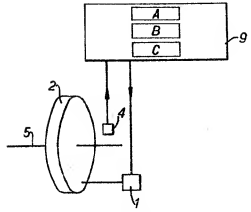
A
B
C
9
2
4
5
1

FIG. 4.

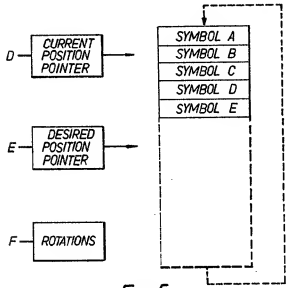
D
CURRENT POSITION POINTER
E
DESIRED POSITION POINTER
F
ROTATIONS
SYMBOL A
SYMBOL B
SYMBOL C
SYMBOL D
SYMBOL E

FIG. 5.